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NATIONAL DAM SAFETY PROGRAM. COLD SULPHUR SPRINGS DAM (INVENTOR--ETC(U)
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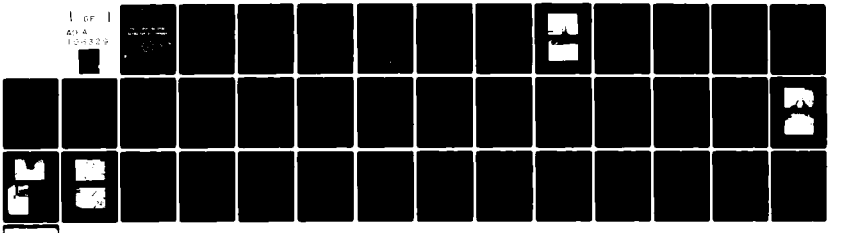

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JAMES RIVER BASIN

AD A106329

LEVEL

Name Of Dam: COLD SULPHER SPRINGS
Location: ROCKBRIDGE COUNTY
Inventory Number: VA 16307

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

MAY 1981

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1 REPORT NUMBER: VA 16307	2 GOVT ACCESSION NO: AD-A106 339	3 RECIPIENT'S CATALOG NUMBER
4 TITLE (and Subtitle): Phase I Inspection Report National Dam Safety Program Cold Sulpher Springs Rockbridge County, VA	5 TYPE OF REPORT & PERIOD COVERED: Final
	6 PERFORMING ORG REPORT NUMBER
7 AUTHOR(s): Norfolk District, Boris O. Taran	8 CONTRACT OR GRANT NUMBER(s)
9 PERFORMING ORGANIZATION NAME AND ADDRESS: U. S. Army Engineer District, Norfolk 803 Front St., Norfolk, VA 23510	10 PROGRAM ELEMENT PROJECT TASK AREA & WORK UNIT NUMBERS
11 CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer District, Norfolk 803 Front St., Norfolk, VA 23510	12 REPORT DATE: May 1981
	13 NUMBER OF PAGES
14 MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15 SECURITY CLASS (of this report): Unclassified
	15a DECLASSIFICATION DOWNGRADING SCHEDULE

16 DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17 DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18 SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151

19 KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams VA
National Dam Safety Program Phase I
Dam Safety
Dam Inspection

20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

(See Reverse Side)

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

JAMES RIVER BASIN

NAME OF DAM: COLD SULPHUR SPRINGS
LOCATION: ROCKBRIDGE COUNTY, VIRGINIA
INVENTORY NUMBER: VA 16307

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

National Dam Safety Program. Cold Sulphur Springs Dam (Inventory Number VA 16307), James River Basin, Rockbridge County, Virginia. Phase I Inspection Report.

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

11 May 1981

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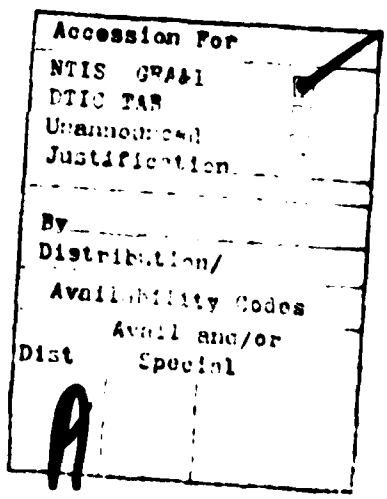


PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Cold Sulphur Springs
State:	Virginia
Location:	Rockbridge County
USGS Quad Sheet:	Millboro, Virginia
Stream:	Cold Sulphur Springs Branch
Date of Inspection:	27 May 1981

Cold Sulphur Springs Dam is an earthfill structure approximately 250 feet long and 26.1 feet high. The dam is owned and maintained by Mr. John C. Goodbar, Mr. Willis F. Edwards, and Mr. Harold F. Edward. The dam is classified as a small size dam with a significant hazard classification. The principal spillway is a concrete open channel located at the right abutment. The emergency spillway is a low area left of the dam used as an access road. The reservoir is used for recreation.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 100-Year Flood. The spillway is capable of passing 13 percent of the PMF without overtopping the crest of the dam. The SDF will overtop the dam by 0.92 feet, reach an average critical velocity of 4.5 feet per second, and pass over the crest of the dam for 1.5 hours. Overtopping velocities are not considered detrimental to the dam. The spillway is adjudged as inadequate, but not seriously inadequate.

The visual inspection revealed a seep on the downstream slope with evidence of piping. Also a shallow 12-foot wide depression was noted 40 feet right of the seep. It is recommended that a geotechnical engineering firm be retained within six months to evaluate the possible piping and the cause for the 12-foot wide depression. It is also recommended that within 12 months a regular maintenance program be initiated to maintain the integrity of the structure and correct those deficiencies listed in Section 7.2.

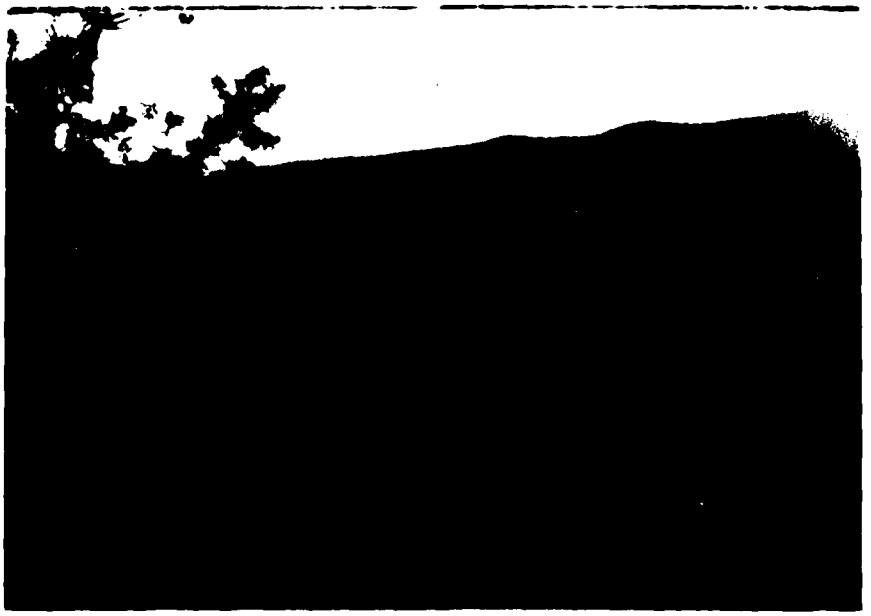
Submitted By:
Original signed by:
Carl S. Anderson, Jr.
CARL S. ANDERSON, JR., P.E.
Acting Chief, Design Branch

Approved:
Original signed by:
Ronald E. Hudson
RONALD E. HUDSON
Colonel Corps of Engineers
Commander and District Engineer

Date: SEP 15 1981

Recommended By
Original signed by
JAMES A. WALSH
JACK G. STARR, P. E.
Chief, Engineering Division

DAM



RESERVOIR

OVERALL VIEWS
COLD SULPHUR SPRINGS DAM
27 MAY 1981

SECTION 1

PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a National Program of Safety Inspections of Dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Cold Sulphur Springs Dam is an earthfill structure approximately 250 feet long and 26.1 feet high. The crest of the dam is 14 feet wide at elevation 1449.0. The upstream slope is approximately 2 horizontal to 1 vertical (2H:1V) and the downstream slope is 2.5H:1V.

Originally a small concrete dam was built on this site. This dam now serves as the core for the earthfill structure. According to Mr. Goodbar, the dam is keyed into the underlying shell rock. It is unknown whether or not there is a drainage system. There are no foundation drain outlets. There is no slope protection.

The principal spillway is a concrete open channel located at the right abutment. The spillway is 20 feet wide and the crest elevation is 1443.0. A concrete chute with wing walls directs the flow to a stilling basin below the toe of the dam.

The emergency spillway is an open area left of the dam used as an access road. The crest width is 50 feet and is at elevation 1448.0.

A 20-inch gas line pipe passes through the dam at low level enabling the reservoir to be drawn down. A 6-inch gate valve is located at the downstream end of the pipe at elevation 1424.0.

1.2.2 Location: Cold Sulphur Springs Dam is located about 0.5 miles west of the intersection of State Routes 780 and 39 in Rockbridge County on the Cold Sulphur Springs Branch of the Calfpasture River.

1.2.3 Size Classification: The dam is classified as small size as defined in Reference 1 of Appendix IV.

1.2.4 Hazard Classification: The dam is located upstream of two homes and a lumber mill. Should a dam failure occur, lives could be lost and property damage incurred. Therefore, the dam is given a significant hazard classification, as defined in Reference 1, Appendix IV. The hazard classification used to categorize a dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The dam is owned by Mr. John C. Goodbar, Mr. Willis F. Edwards and Mr. Harold F. Edwards.

1.2.6 Purpose: Recreation

1.2.7 Design and Construction History: The dam was designed with the guidance of the county agent from the extension service of Virginia Polytechnic Institute and constructed by Mr. John C. Goodbar and Mr. W. Edwards. The dam was completed in 1960. There is no information on the concrete dam.

1.2.8 Normal Operational Procedures: Operation of the dam is automatic with water flowing through the principal spillway when the reservoir rises above elevation 1443.0. Flows through the emergency spillway occur when the reservoir rises above elevation 1448.0.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 1.94 square miles.

1.3.2 Discharge at Dam Site: The maximum flood observed was during Tropical Storm Camille in 1969. Flow was estimated to be 3 to 4 feet in the principal spillway.

Pool level at crest of dam

Principal Spillway 882cfs
Emergency Spillway.....1357cfs

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet msl	Area Acres	Reservoir Capacity Acre feet	Watershed, Inches	Length, feet
Crest of Dam	1449.0	11.5	145	1.4	2000
Emergency Spillway Crest	1448.0	10.0	130	1.3	1900
Principal Spillway Crest	1443.0	6.4	64	0.6	1130
Streambed at Downstream toe of dam	1422.9±	-	-	-	-

SECTION 2

ENGINEERING DATA

2.1 Design: The earthfill dam was designed with guidance from the county extension agent of Virginia Polytechnic Institute. However, there is no available design information. There is no information on the old concrete dam. However, it is described as a concrete structure across the stream with a rectangular notch for a principal spillway.

2.2 Construction: The dam was constructed by Mr. John C. Goodbar and Mr. W. Edwards, two of the present owners. The dam was completed in 1960. According to Mr. Goodbar, the 20-inch gas pipe, serving as a low level drain, was placed in the rectangular spillway of the concrete dam. The downstream end of the spillway was plugged with a bulkhead (headwall) and the dam covered with fill. The embankment was constructed with a "clay type" soil borrowed from the reservoir. A decomposed shale was placed on the embankment for protection. No foundation drains were constructed. The foundation of the concrete dam and principal spillway are keyed into the shale bedrock. There is no construction information on the old concrete dam.

2.2 Evaluation: There is insufficient information to evaluate the foundation condition and the embankment stability.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1. General: The results of the 27 May 1981 inspection are recorded in Appendix III. At the time of the inspection, the weather was overcast and the temperature was about 70°F. The pool elevation was approximately 1443 feet msl or about normal pool. The tailwater elevation was at 1422.9 feet msl. There are no known past inspection reports available.

3.1.2 Dam: The general soil condition was dry. There are no signs of surface cracks, unusual movement, or misalignment. There is surface erosion on the upstream slope probably due to pedestrian traffic and aggrevated by surface runoff. Also, on the downstream slope, there is a depression, approximately 2 feet in depth caused by a seep flowing at a minimum rate of 1.1 gpm. A probing in the seep indicated a very soft material to a depth of 2 feet. The seep is located approximately 4 feet in elevation directly above the 20-inch gas pipe serving as a low level drain. The seep is possibly caused by leakage along the pipe where the bulkhead plugs the rectangular spillway of the concrete dam. According to Mr. Goodbar, the seepage started shortly after the construction of the earth embankment and has not increased. There is an additional depression, about 40 feet to the right of the seep. It is about 12 feet in diameter and 1.5 feet in depth.

There is an animal burrow approximately 30 feet left of the principal spillway and halfway down the downstream slope. It is about 8 inches in diameter and greater than 6 feet in depth.

There are trees and shrubs covering both the upstream and downstream slopes. The trees are as large as 12 inches in diameter.

3.1.3 Principal Spillway: The control section is a 20-foot wide concrete weir which maintains normal pool. The concrete has some cracking and spalling. The approach channel is the reservoir. The discharge channel is a 20-foot wide concrete chute directing flow to the tailwater beyond the downstream toe of the dam. The end of the concrete chute is undermined about 4 feet on the right side. This was probably due to an eroded channel down the right side of the principal spillway.

3.1.4 Drawdown Outlet Works: The intake structure is submerged and not observable. The drawdown gate valve is located at the downstream toe at about station 1+00 as shown on Plate 3. The 20-inch gas line pipe appears to be in satisfactory condition.

3.1.5 Emergency Spillway: The control section is in natural ground to the left of the dam. A gravel access road passes through the spillway. The approach channel is a gravel road descending in elevation and connecting to the immediate reservoir slope. The discharge channel is a gravel road descending in elevation which allows flows to pass to the downstream toe area.

3.1.6 Instrumentation: There is no instrumentation on the dam.

3.1.7 Reservoir Area: The reservoir slopes are moderately steep and heavily wooded. There are no signs of reservoir slope failures or shoreline erosion. No debris was observed in the reservoir. There is no available information pertaining to sedimentation.

3.1.8 Downstream Channel: The downstream channel is narrow with moderately steep and heavily wooded slopes. There are some large rocks and trees in the channel directly below the dam. Two homes are located about 0.5 miles downstream of the dam. A lumber mill is located approximately one mile downstream.

3.2 Evaluation: Overall, the dam appears to be in good condition. However, the seep on the downstream slope, and the depression caused by this seep are sign of possible piping. This problem and the 12-foot wide depression 40 feet right of the seep are further evaluated in Section 6. In addition, the inspection revealed certain preventative maintenance items which should be scheduled as part of an annual maintenance program. These are:

a. The trees and shrubs on both slopes should be cut off at the ground surface. Any trees with a diameter greater than 3 inches should have their root systems removed and subsequent holes backfilled with compacted material and seeded.

b. A continuous program to control vegetative growth in the emergency spillway channel and on the embankment should be instituded as part of a regular maintenance program.

c. The animal burrow should be backfilled with compacted fill and seeded.

d. The eroded areas on the upstream slope should be dressed with compacted fill and seeded.

e. A staffgage should be installed in the reservoir to extend above the top of the dam.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures The normal storage pool is 1443.0 ft. msl, which is the crest of the principal spillway. The reservoir provides recreation. Water passes automatically over the principal spillway as the reservoir rises above elevation 1443.0. Water will also flow over the emergency spillway as the pool rises above elevation 1448.0. A 20-inch gas line pipe passes through the dam at low level and exits the dam at the downstream toe of the dam. A 4-inch valve located on the downstream end of the pipe is available to lower the reservoir below normal pool.

4.2 Maintenance There is no regular maintenance program for Cold Sulphur Springs Dam.

4.3 Warning System At present time, there is no warning system or evacuation plan for Cold Sulphur Springs.

4.4 Evaluation The dam does not require an elaborate operational and maintenance program. However, a regular maintenance program, complete with documentation, should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

SECTION 5
HYDRAULIC/HYDROLOGIC DATA

5.1 Design None were available.

5.2 Hydrologic Information. None were available.

5.3 Flood Experience: The maximum flood observed was during Tropical Storm Camille in 1969, when flow 3 to 4 feet in depth passed through the principal spillway.

5.4 Flood Potential: The 100-year flood, 1/2 PMF, and PMF were developed and routed through the reservoir by use of the HEC-1DB computer program (Reference 2, Appendix IV) and appropriate unit hydrograph, precipitation and storage - outflow data. Clark's Tc and R coefficients for the local drainage area were estimated from basin characteristics. The rainfall applied to the developed unit hydrograph was obtained form the U. S. Weather Bureau Publications (References 3 and 4, Appendix IV).

5.5 Reservoir Regulations: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically over the principal and emergency spillways as the reservoir rises above elevations 1443.0 and 1448.0, respectively.

The storage curve was developed based on areas obtained from a U. S. Geological Survey Quadrangle Map. Survey data taken during the inspection was correlated to the Millboro, Virginia Quadrangle Map to help develop area storage data. Rating curves for the principal spillway, emergency spillway, non-overflow section and drawdown facilities were developed by hand. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the principal spillway crest (elevation 1443.0).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal flow	100 1/ year	1/2 PMF	PMF 2/
Peak flow, c.f.s.				
Inflow		2432	6772	13545
Outflow		2432	6772	13545
Maximum elevation ft. msl	1443.0	1449.92	1452.05	1454.34
Non-overflow section elevation 1449.0				
Depth of flows, ft		0.92	3.05	5.36
Duration, hrs.		1.50	4.75	8.00
Velocity, fps. 3/		4.50	8.10	10.85
Tailwater elevation	1422.9±	-	-	-

1/ The 100-Year Flood has one chance in 100 of occurring in any given year.
2/ The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.
3/ Critical Velocity

5.7 Reservoir Emptying Potential: A 20-inch gas pipe with a 6-inch valve at the downstream toe of the dam (elevation 1423) is available to dewater the reservoir. The low level outlet will permit a withdrawal of about 4 cfs with the reservoir at the crest of the principal spillway (elevation 1443.0) and essentially dewater the reservoir in approximately 19 days. This is equivalent to an approximate drawdown rate of 1 foot per day based on the hydraulic height measured from normal pool divided by the time to dewater the reservoir.

5.8 Evaluation: Based on the size (small) and hazard classification (significant), the recommended Spillway Design Flood is the 100-year flood to the 1/2 PMF. Because of the risk involved, the 100-year flood has been selected as the SDF. During the SDF, the crest of the dam will be overtopped by 0.92 feet for a maximum 1.5 hours and reach an average critical velocity of 4.5 feet per second.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutment: There is no detailed information available on the foundation conditions. The dam is located within the Valley and Ridge physiographic province of Virginia which is underlain by the Brallier Formation of the middle devonian system. The Brallier Formation is composed of thin, regularly bedded, fissle to subfissle, micaceous, light gray to brown to olive drab shales, siltstones, and very fined grained sandstones. The sandstones are commonly well jointed and some isolated fissle black shale has been found. Deformation was intense in the area and small overturned folds and low angle thrust faults are widespread. According to Mr. Goodbar, the old concrete dam is keyed into firm shale bedrock. There is no drainage system. The foundation is considered stable and impervious.

6.2 Embankment:

6.2.1 Material: There is no detailed information available on the nature of the embankment materials. The only known information is that the borrow area was located in the reservoir area, and the soil was a "clay type" material. A decomposed shale was placed on the embankment for protection. The area soils are generally alluvial low plastic silts (ML) and silty clays (CL). The nature of the embankment materials is considered to be homogeneous.

6.2.2 Stability: There are no available stability calculations. The dam is 26.1 feet high and 14 feet wide. A gravel access road traverses the crest of the dam. The upstream slope is 2H:1V, and the downstream slope is 2.5H:1V. The dam is subjected to sudden drawdown because the approximate reservoir drawdown rate of 1.0 foot per day exceeds the critical rate of 0.5 feet per day for earth dams. The existing pool is approximately maximum control storage pool which is the crest of the principal spillway.

According to the guidelines presented in Design of Small Dams, U.S. Department of The Interior, Bureau of Reclamation for small homogeneous dams, with a stable foundation, subjected to a drawdown and composed of low plastic fines (ML, CL), the recommended upstream slope is 3H:1V and the downstream slope in 2.5H:1V. The recommended width is 15 feet.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dam, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margin exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. The visual inspection revealed no apparent

instability of the upstream slope, but revealed potential problems on the downstream slope. There is a seep with potential piping located above the low level outlet pipe. Also, there is a shallow 12-foot wide depression 40 feet right of the seep. Based on Bureau of Reclamation guidelines, the dam has an adequate downstream slope, but an inadequate upstream slope and crest width.

The major stability concern is when the upstream slope is subjected to a sudden drawdown. However, the embankment has a concrete core to prevent a total breach of the embankment and the width is not seriously inadequate. Also, the visual inspection revealed no apparent instability of the upstream slope. Therefore, the embankment is considered stable and no stability check is required.

The seep and possible piping does threaten the integrity of the dam. Also, the 12-foot wide depression warrants concern. A geotechanical engineering firm should be retained within six months to evaluate the possible piping from the seep on the downstream slope and also the 12-foot wide depression.

Overtopping flows are not considered deterimental. The velocity is less than 6 fps, the effective eroding velocity for a vegetated earth embankment.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There is insufficient engineering data to evaluate the foundation condition and the embankment stability. The visual inspection revealed a seep with possible piping on the downstream slope, and depression 40 feet right of the seep. There is no emergency operation and warning plan or a regular maintenance problem. However, the dam is in good condition and a stability check is not required.

Corps guidelines indicate the appropriate spillway design flood is the 100-year flood. The spillway will pass 13 percent of the PMF without overtopping the dam. The SDF will overtop the dam by 0.92 feet for a maximum 1.5 hours and reach an average critical velocity of 4.5 fps. The overtopping velocities are not considered detrimental to the embankment. The spillways are adjudged as inadequate but not seriously inadequate.

7.2 Recommend Remedial Measures: It is recommended that a geotechnical engineering firm be retained within six months to evaluate the possibility of piping at the seep on the downstream slope and the cause for the 12-foot wide depression. Also, an annual maintenance program should be initiated within 12 months to maintain the integrity of the structure. The inspection revealed the following maintenance items that should be scheduled by the owner during the regular maintenance program:

a. The trees and shrubs on both slopes should be cut off at the ground surface. Any trees with diameter greater than 3-inches should have their root systems removed and subsequent holes backfilled with compacted material and seeded.

b. Dress the eroded areas on the upstream slope with compacted fill and seed.

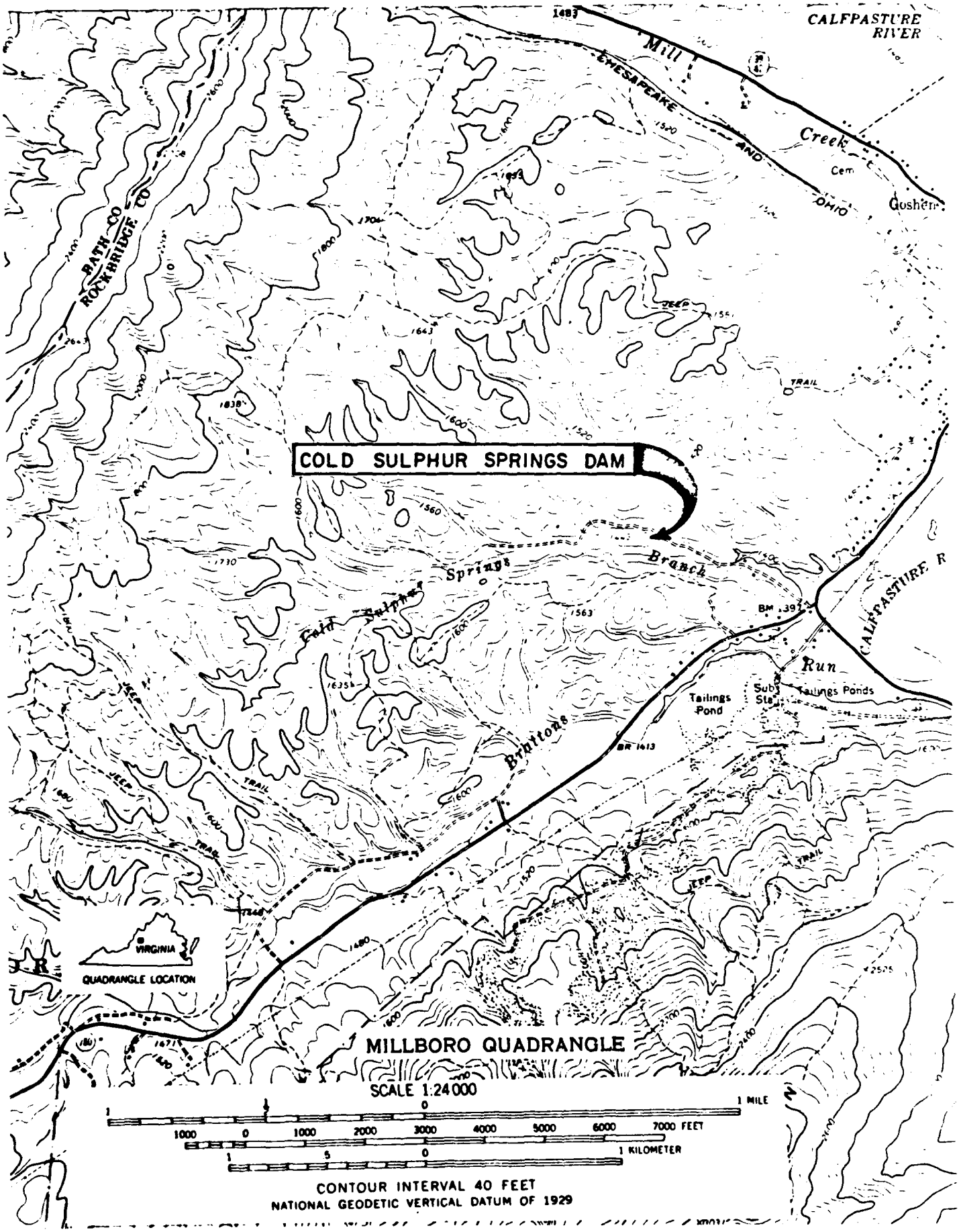
c. A continuous program to control vegetative growth on the embankment should be instituted as part of a regualr maintenance program.

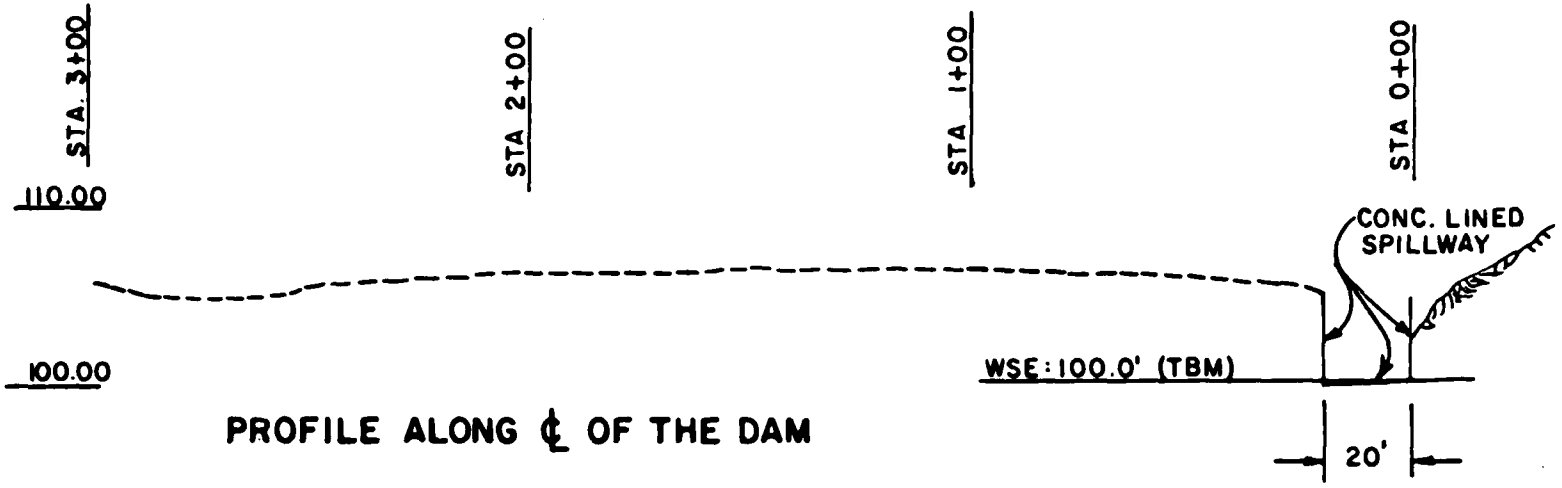
d. The animal burrow, 30 feet left of the principal spillway and halfway down the downstream slope, should be backfilled with compacted fill and seeded.

e. A staffgage should be installed in the reservoir to extend above the top of the dam.

APPENDIX I

MAPS AND DRAWINGS


CALFPASTURE RIVER
Mill
CHESAPEAKE AND OHIO
Creek
Cem
Goshen
BATH CO
ROCKBRIDGE CO
TRAIL
COLD SULPHUR SPRINGS DAM
Branch
Springs
Cold Sulphur
BM 1397
CALFPASTURE R
Run
Tailings Pond
Sub Sta
Tailings Ponds
Brattons
BR 1413
JEEP
TRAIL
VIRGINIA
QUADRANGLE LOCATION
MILLBORO QUADRANGLE
SCALE 1:24000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



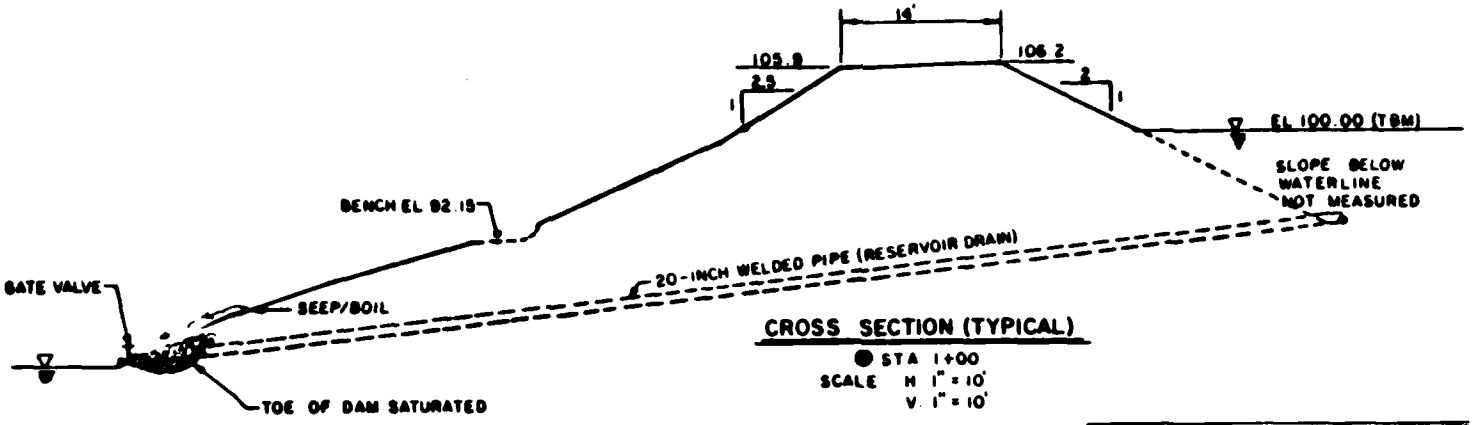
PROFILE ALONG ℄ OF THE DAM

SCALE H: 1" = 40'
V: 1" = 10'

NOTES:
1. PROFILE PREPARED FROM FIELD NOTES.
2. ELEVATIONS BASESED ON TBM = 100.0 (WATER SURFACE OF RESERVOIR)

COLD SULPHUR SPRINGS DAM
ROCK BRIDGE COUNTY
27 MAY 1981
NORFOLK DISTRICT CORPS OF ENGINEER
PLATE 2

80



CROSS SECTION (TYPICAL)

● STA 1+00
SCALE H 1" = 10'
V 1" = 10'

NOTES

1. CROSS SECTION PREPARED FROM FIELD NOTES
2. ELEVATIONS BASED ON TBM = 100.00 (WATER SURFACE OF RESERVOIR)
3. TAILWATER EL = 79.9 BELOW SPILLWAY DISCHARGE CHANNEL

COLD SULPHUR SPRINGS DAM
ROCK BRIDGE COUNTY
27 MAY 1981
NORFOLK DISTRICT CORPS OF ENGINEERS
PLATE 3

BOT

APPENDIX II

PHOTOGRAPHS

PHOTO #1 CREST OF DAM

PHOTO #2 UPSTREAM FACE

PHOTO #3 THE SPILLWAY

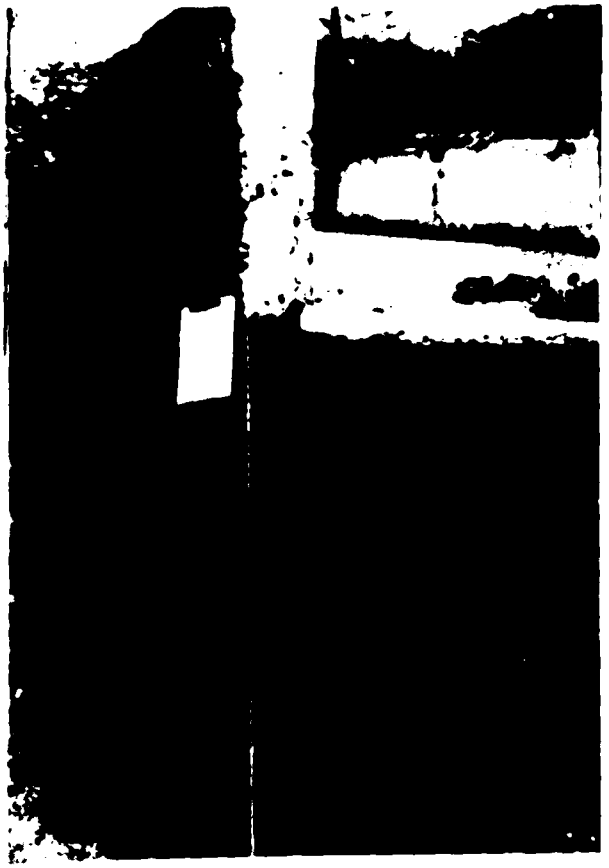


PHOTO #4 ERODED / UNDERCUT AREA AT DISCHARGE END OF SPILLWAY

PHOTO #5 6-INCH GATE VALVE ON 20-INCH RESERVOIR DRAIN PIPE

PHOTO #6 INTERCEPTED FLOW FROM SEEP / BOIL ON DOWNSTREAM FACE OF DAM

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam: Cold Sulpher Spring County: Rockbridge State: Virginia Coordinates: Lat. 3758.5
Long. 7931.0

Date(s) Inspection: 27 May 1981 Weather: Overcast Temperature: 70°±

Pool Elevation at Time of Inspection: 1443.0 Tailwater at Time of Inspection: 1416.9 ±

Inspection Personnel:

Joe Miller	COE	Jim Robinson	COE
Bo Taran	COE	Hugh Gildea	SWCB
Len Jones	COE	Mr. John C. Goodbar (part owner)	

Miller & Robinson Recorders

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No surface cracks were visible. Approximately 30 feet left of the left side of the principle spillway and half way down the downstream slope, there is an animal burrow about 8 inches in diameter and greater than 6 feet in depth.	The animal burrow should be backfilled with compacted fill and seeded.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	There is no unusual movement or cracking at or beyond the toe.	None
SLOUGHING OR EROSION EMBANKMENT AND ABUTMENT SLOPES	There is surface erosion on the upstream slope probably due to pedestrian traffic and aggravted by surface runoff. There is a 2-foot deep depression on the downstream slope caused by the seep. A probing at the seep indicates very soft material to a depth of 2 feet in the area, indicating possible piping. Also, about 40 feet to the right of the seep is another depression about 1.5 feet deep and about 12 feet in diameter.	The eroded areas on the upstream slope should be dressed up with compacted fill and seeded. Piping - Not yet critical but requires remedial attention. Recommend retaining the services of a Geotechnical firm for evaluation of possible piping and the two depressions.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	There were no drawings to compare the alignment. However, the alignments showed no signs of movement. The top of the dam serves as a gravel access road.	None
RIPRAP FAILURES	There is no riprap.	None.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FOUNDATION	Per a conversation with Mr. Goodbar, the old concrete dam was keyed into firm shale bedrock.	None.
ANY NOTICEABLE SEEPAGE	There was a large seep, minimum flow of 1.11 GPM, located on the downstream slope as shown on Plate 1. The seepage started shortly after the construction of the earth embankment, and has not increased according to Mr. Goodbar.	The seep is probably the result of running the 20 inch gas pipe serving as a low level drain through the concrete dam. The pipe was placed in the rectangular spillway of the concrete dam. The downstream end of the spillway was plugged with a bulkhead (headwall) and the dam was covered with fill. The seep is possibly caused by leakage along the pipe where the bulkhead plugs the rectangular spillway.
DRAINS	There are no known drains.	None
MATERIALS	The surface material is a decomposed shale. According to Mr. Goodbar, most of the embankment material was borrowed from the reservoir, and was a clay type soil. The decomposed shale was placed on the top for protection.	None.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	The upstream and downstream slopes were covered with brush and trees up to 12-inches in diameter.	All trees and shrubs on the dam should be cut off at the ground surface. Any trees with a diameter greater than 3 inches should have their root systems removed and subsequent holes back-filled with compacted material and seeded.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	The control section is a 20-foot wide concrete weir which maintains normal pool. The concrete has some cracking and spalling.	None.
APPROACH CHANNEL	The approach channel is the reservoir.	None.
DISCHARGE CHANNEL	The discharge channel is a 20 foot wide concrete chute directing flows to an area below the toe of the dam. The end of the concrete chute is undermined about 4 feet.	None.
EMERGENCY DRAWDOWN	The drawdown gate valve is located at the downstream toe near the center of the dam. The 20-inch gas line pipe and 6-inch valve appear to be in satisfactory condition.	None.

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATION	REMARKS AND RECOMMENDATIONS
CONTROL SECTIONS	The control section is in natural ground to the left of the dam. A gravel access road passes through the spillway. This area is lower than the crest of the dam and will pass flows around the dam before the crest of the dam is overtopped.	None
APPROACH CHANNEL	The approach channel is a gravel road descending in elevation and connecting to the immediate reservoir slope.	None
DISCHARGE CHANNEL	The discharge channel is a gravel road descending in elevation which would allow flows to pass to the downstream toe area.	None

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	There are no known monuments in the immediate area.	None.
OBSERVATION WELLS	There are no wells.	None.
WEIRS	There are no weirs.	None.
PIEZOMETERS	There are no piezometers.	None.
STAFFGAGES	There are no staffgages.	A staffgage should be installed in the reservoir to extend above the crest of the dam.

RESERVOIR

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoir slopes are moderately steep and heavily wooded. No debris was observed in the reservoir.	None.
SEDIMENTATION	The inspection team was unable to evaluate the sedimentation in the reservoir. There was no available information.	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel is narrow with heavy vegetation lining the channel below the stilling basin. Large rocks and trees provide some obstruction to flows downstream of the dam.	None.
SLOPES	The slopes are moderately steep and heavily wooded.	None.
APPROXIMATE No. OF HOMES AND POPULATION	Two homes are located about 0.5 miles downstream of the dam near the streambanks. A lumber mill is located approximately one mile downstream and could sustain dangers should there be a dam failure.	None.

APPENDIX IV

REFERENCES

APPENDIX IV

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Department of the Army, Washington, D. C.

2. HEC-1DB Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, September 1978.)

3. "Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (U. S. Weather Bureau, June 1978).

4. "Rainfall Frequency Atlas of the Unites States", Technical Paper No. 40, (U S. Weather Bureau, May 1961).


DATE
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